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The Price of Luck

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Abstract

We report the results of a simple statistical choice task based on independent and identically distributed (iid) variables. In our experiment subjects were asked whether they were willing to pay to bet on the future performance of players in a coin toss task, who had previously been successful in that task. We conducted a treatment with the BDM and one with a Fixed Price. In both cases, subjects exhibit a strong, irrational bias towards placing their bets on players with a good guessing history in the coin toss task. Subjects' elicited preferences are compatible with prescriptive luck beliefs. That is, the idea that luck is a somehow deterministic and personal attribute.

Keywords: decision heuristics, cognitive bias, economic experiments

JEL numbers: C91

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1. Introduction

We use a classroom experiment to test the ability of advanced undergraduate finance students to understand iid phenomena not directly related to their study. We ran two experimental treatments, both divided in three phases. In Phase I part of the students in the classroom (Group A) were each asked to guess a sequence of five coin tosses in an incentive based manner. In Phase II the rest of the students (Group B), who acted as observers in Phase I, had to place a bet on Group A subjects guessing another sequence of five coin tosses in Phase III. By default all the bets were allocated to one of the lowest performing students in Group A.

In the BDM treatment students were asked to quote prices at which they would be willing to switch to another Group A subject. Specifically, Group B subjects needed to provide their willingness-to-pay to switch from any level of performance to each of all possible higher levels of performance. This task was incentive-based according to the well-known Becker-DeGroot-Marschack mechanism (BDM).[1] If students were able to understand the iid nature of coin tosses they should be willing to pay nothing to switch to a better performing student. The vast majority of Group B subjects, 23 out of 28, showed some willingness-to-pay to switch to a better performing Group A subject.

The BDM mechanism has the advantage of yielding rich data on the issue we are interested in. However, the BDM may lead to estimation biases caused by the "payoff dominance" issue reported in a well-known debate in the early 1990s, see Harrison (1992).[2] To control for this, we run a second, Fixed Price, treatment in which we informed Group B subjects of the actual lowest and highest performing Group A subject and put a fixed price on switching. Roughly, 50% percent of the effect found in the BDM treatment survives the removal of the Becker-DeGroot-Marschack mechanism.

Some studies in experimental economics and psychology find a variety of prominent biases when subjects face statistical tasks in the laboratory. Most of this literature is related to the so-called Gambler's (Tversky and Kahneman, 1971) and Hot-hand (Gilovich et al, 1985) fallacies. In a nutshell, the Hot-hand fallacy is the belief that a person who has experienced success with a random event has a greater chance of further success in additional attempts. The Gambler's fallacy refers to the belief that if something happens more frequently than expected during some period, then it will happen less frequently in the future. There have been attempts to explain both fallacies with models assuming boundedly rational agents incapable of performing proper statistical inference, see for instance Rabin (2000) or Rabin and Vayanos (2010), see also Offerman and Sonnemans (2004) for an experimental test.[3]

[1] J. W. von Goethe made the first known attempt to use the BDM mechanism back in 1797.
[2] There are other well documented behavioural biases affecting the BDM, ie game recognition problems as in Cason and Plott (2014). We don't believe those are relevant in our case. See section 4 for a detailed discussion.
[3] Boundedly rational agents or experimental subjects are given outcomes generated by iid variables and perform biased inferences.

In these models and experiments agents or subjects are typically not informed about the distribution of the data generation process, like basketball players allegedly affected by the Hot-hand fallacy, and they need to perform statistical inference based on a more or less long stream of observations. Our experiment goes one step *back*. That is, our subjects are fully informed about the data generating process, coin toss, which is indeed iid.

Our results suggest that a sizeable proportion of subjects with formal training in statistics are easily biased by past performance, which in our experiment should be understood to depend on just mere chance. A possible explanation relies on biased Group B subjects believing in the ability of some Group A subjects to be better at guessing coin tosses than others. That is, a sizeable proportion of Group B subjects may believe in phenomena such as Extra Sensorial Perception (ESP)[4] or Prescriptive Luck.[5] According to Darke and Freedman (1997) Prescriptive Luck is the perception that good luck is a stable characteristic that consistently favours some people but not others, see also Thompson and Prendergast (2013) for an example of recent work on the topic. Our result, which from now on we will call Belief in Luck, offers a direct plausible explanation to the findings reported in Jorgensen et al (2011), participants in the Danish Lotto believe they can predict future draws and in Powdthavee and Riyanto (2012), subjects are willing to pay for useless advice. Also note that in our context Belief in Luck is consistent with the well-known "take the best and forget the rest" heuristic, see Gigerenzer and Goldstein (1996).

The rest of the article is structured as follows. Section 2 describes the experimental design in detail. Section 3 contains the statistical analysis of the experimental results and Section 4 discuses.

2. Experimental design

The experiment consists of two treatments, BDM and Fixed Price (FP). We ran a BDM session with a total of 20 subjects in Group A and 28 in Group B for BDM. We ran two sessions in the FP treatment with 40 subjects in Group A and 47 in Group B.

2.1 Procedures common to all treatments

All the sessions took place in a classroom environment. Participants were seated apart so they could not observe others' decisions. Upon arrival students were randomly assigned to one of the three groups: A, B or X. There was only one subject in Group

[4] A whopping 41% of respondents to a 2005 Gallup poll indicate they believe in ESP. The same poll shows that 73% of Americans believe in some kind of paranormal activity, not including religious beliefs. We were not able to find data from a Spanish pollster.

[5] As opposed to Descriptive Luck. That is the use of the word luck as a way to describe fortunate or unfortunate events.

X, whose task was to toss a coin. Students were also asked not to communicate with each other, assigned a participant number and then individually led to their seats. Once all participants were seated, one of the experimenters read the instructions.[6] Then Phase I of the experiment began. Before each coin toss by subject X, each Group A subject had to place a bet on either heads or tails. Group A subjects earned 2 EUR for each hit, but nothing for a miss. Group B subjects just observed the coin tosses during Phase I and did not make any decisions at this stage.

After all five coin tosses had taken place we asked six subjects of Group A to leave the room with one of the experimenters. Note that six is the number of possible different numbers of hits of the Group A subjects (0 to 5). Among those six participants there were the Group A subjects with the highest and the lowest number of hits.

Then Phase II of the experiment began. Group B subjects were told that in Phase III:

- The two Group A subjects with the highest and lowest numbers of hits would be guessing on five subsequent throws of the coin.
- All the Group B subjects were initially assigned to the Group A subject with the lowest number of hits.
- Each Group B subject could now, in Phase II, either stick to this assignment or switch to the one with the highest number of hits.
- Group B subjects would need to pay a price if they wanted to switch to the subject with the highest number of hits.

2.2 The BDM treatment

In the BDM treatment, subjects were asked to fill out a table indicating the conditional prices for each possible combination of highest and lowest numbers of hits. They were allowed to give prices from zero to ten EUR by increases 0.5 EUR. Once every Group B subject had made these decisions, the two Group A subjects with the effectively highest and lowest numbers of hits were asked to come back into the room. At that moment Group B subjects were informed what the highest and lowest numbers of hits had been. This determined for each Group B subject the “personal change price,” that is, the price a Group B subject had given to switch from the *actual* lowest number of hits to the *actual* highest number of hits. Following the BDM procedure we draw a random price from 0 EUR to 10 EUR. If the randomly chosen price was above a Group B subject personal change price, she was not allowed to change and, hence, did not incur in any cost. If the randomly chosen price was smaller or equal than the personal change price then the Group B subject was allowed to change, and paid the randomly chosen price.

[6] An English translation of the original instructions can be found in the Appendix.

Then, Phase III of the experiment started. The two Group A subjects with the highest and lowest number of hits placed bets on five subsequent coin tosses by subject X. Group B subjects who did not change their default Group A subject went with the Group A subject with the lowest number of hits in Phase I. They bet 2 EUR on each of the corresponding Group A subject's guess of the coin flip. If the Group A subject got a hit the Group B subject earned twice his bet, 4 EUR. If the Group A subject got a miss, the Group B subject earned nothing.

The Group B subjects who changed subjects went with the Group A subject with the highest number of hits in Phase I. They bet (10 – randomly determined price)/5 EUR on each of the corresponding Group A subject's guess of the coin flip. If the Group A subject got a hit the Group B subject earned twice his bet 2*((10 – randomly determined price)/5) EUR, if the Group A subject got a miss, the Group B subject earned nothing.

Once Phase III was finished, we paid participants individually and the experiment ended.

2.3 The FP treatment

After Phase I concluded, Group B subjects were informed about the actual highest and lowest numbers of hits achieved by Group A subjects. To determine whether a Group B subject was allowed to switch she had to answer the following question: Would you like to switch your bet to the subject with highest number of hits for *Y* EUR? *Y* was the median value of the prices elicited in the BDM treatment according to the distance in hits between the Group A subject with the highest number of hits and the Group A subject with the minimum number of hits. *Y* was 2 EUR and 1.5 EUR for FP-1 and FP-2 respectively.

Then, Phase III of the experiment started. The two Group A subjects with the highest and lowest number of hits placed bets on five subsequent coin tosses by subject X. Group B subjects who did not switch their default Group A subject went with the Group A subject with the lowest number of hits in Phase I. They bet 2 EUR on each of the corresponding Group A subject's guesses of the coin flip. If the Group A subject got a hit the Group B subject earned twice his bet, 4EUR. If the Group A subject got a miss, the Group B subject earned nothing.

The Group B subjects who choose to switch subjects went with the Group A subject with the highest number of hits in phase in Phase I. They bet EUR (10 – *Y*)/5 EUR on each of the corresponding Group A subject's guess of the coin flip. If the Group A subject got a hit the Group B subject earned twice his bet 2*((10 – *Y*)/5) EUR, if the Group A subject got a miss, the Group B subject earned nothing.

Once Phase III was finished, we paid participants individually and the experiment ended.

3. Results

3.1 BDM treatment

Subject ID	0-1	0-2	0-3	0-4	0-5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
1	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
2	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
3	*0.5*	*1*	*2.5*	*3.5*	*4*	*0.5*	*1.5*	*2.5*	*3.5*	*1*	*2*	*3*	*1*	*2*	*0.5*
4	*0*	*0*	*0.5*	*0.5*	*1*	*0*	*0*	*0.5*	*0.5*	*0*	*0*	*0.5*	*0*	*0*	*0*
5	*0*	*0*	*0*	*1*	*1*	*0*	*0*	*1*	*1*	*0*	*0.5*	*0.5*	*0*	*0*	*0*
6	*1.5*	*2*	*2.5*	*2.5*	*2.5*	*2*	*2*	*2.5*	*2.5*	*2*	*2.5*	*2.5*	*2.5*	*2.5*	*2.5*
7	*0.5*	*1*	*1.5*	*2*	*2.5*	*0.5*	*1*	*1.5*	*2*	*0.5*	*1*	*1.5*	*0.5*	*1*	*0.5*
8	*3*	*3.5*	*4*	*4.5*	*5*	*2.5*	*3*	*3.5*	*4*	*2*	*2.5*	*3*	*2*	*2.5*	*2*
9	*1*	*3*	*4*	*8*	*10*	*1.5*	*3*	*8*	*10*	*3.5*	*7*	*9.5*	*7*	*8*	*5*
10	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
11	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
12	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*1*	*0*	*0*	*0.5*	*0*	*0.5*	*0*
13	*0.5*	*1*	*1.5*	*2*	*3*	*0.5*	*1*	*1.5*	*2*	*0.5*	*1*	*1.5*	*0.5*	*1*	*0.5*
14	*0.5*	*1*	*1.5*	*2*	*2.5*	*0.5*	*1*	*1.5*	*2*	*0.5*	*1*	*1.5*	*0.5*	*1*	*0.5*
15	*1*	*3*	*5*	*7*	*9*	*1*	*3*	*5*	*7*	*1*	*3*	*5*	*1*	*3*	*1*
16	*0*	*0*	*0*	*2.5*	*2*	*0*	*0*	*2.5*	*3*	*0*	*0*	*0*	*0*	*0*	*0*
17	*0*	*0*	*0.5*	*1*	*1*	*0*	*0*	*0.5*	*1*	*0*	*0*	*0.5*	*0*	*0*	*0*
18	*0*	*0.5*	*0.5*	*1*	*2*	*0*	*0.5*	*0.5*	*1*	*0*	*0.5*	*0.5*	*0*	*0.5*	*0*
19	*0*	*0*	*0.5*	*1*	*1.5*	*0*	*0*	*0.5*	*1*	*0*	*0*	*0.5*	*0*	*0*	*0*
20	*0.5*	*1*	*1.5*	*2*	*2.5*	*0.5*	*1*	*1.5*	*2*	*0.5*	*1*	*1.5*	*0.5*	*1*	*0.5*
21	*1*	*2*	*2.5*	*3*	*3.5*	*3*	*4*	*5*	*6*	*6*	*7*	*8*	*7.5*	*8*	*10*
22	*2*	*2.5*	*3.5*	*4*	*5.5*	*2.5*	*3.5*	*4*	*4.5*	*4*	*4.5*	*5.5*	*2.5*	*4.5*	*4*
23	*0*	*2.5*	*5*	*7.5*	*10*	*0*	*2.5*	*5*	*7.5*	*0*	*2.5*	*5*	*0*	*2.5*	*0*
24	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
25	*1*	*1.5*	*3*	*3.5*	*4*	*1*	*1.5*	*3*	*3.5*	*1*	*1.5*	*3*	*1*	*1.5*	*0.5*
26	*0.5*	*0.1*	*1.5*	*2.5*	*3*	*1.5*	*2*	*3*	*3.5*	*2.5*	*3.5*	*4*	*4*	*4.5*	*5*
27	*0*	*1*	*1.5*	*2*	*2.5*	*0*	*1*	*1.5*	*2*	*0*	*1*	*1.5*	*0*	*1*	*0*
28	*0.5*	*1*	*3*	*4*	*4.5*	*0.5*	*1*	*4*	*4*	*0.5*	*1*	*3*	*0.5*	*1*	*0.5*
Median	***0.25***	***1***	***1.5***	***2***	***2.5***	***0.25***	***1***	***1.5***	***2***	***0.25***	***1***	***1.5***	***0.25***	***1***	***0.25***

Table 1. Willingness-to-pay to switch, BDM treatment

Table 1 shows all the prices chosen by subject and Figure 1 shows the change-prices elicited from the 28 Group B subjects for each of the possible differences in previous hits, distributed in the four quartiles (the * denote outliers). The larger the increase in hits the larger the price participants are willing to pay.

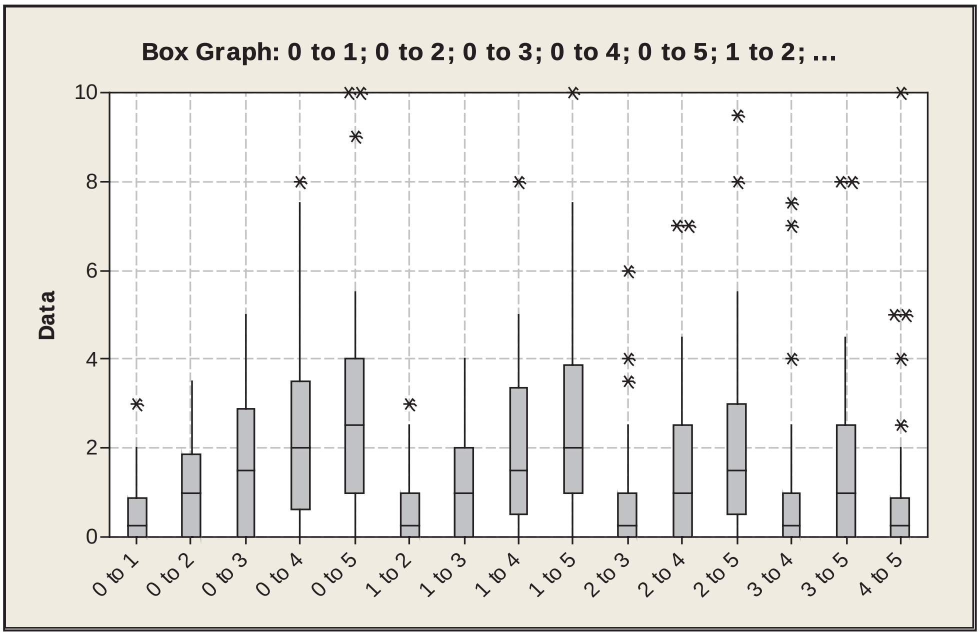

Figure 1: Box-plot of distances

D*x* in table 2 refers to the average price for all distances of size *x*.[7] Table 2 shows the t-statistics and p-values for the comparison of averages of each pair of distances, based on individual data. The table shows that all the differences for one-step distances are not significant, while, with just one exception, they are significant for all cases of higher distances.

	D1-D2	D2-D3	D3-D4	D4-D5	D1-D3	D2-D4	D3-D5	D1-D4	D2-D5	D1-D5
t	*-1.18*	*-1.37*	*-0.94*	*-0.65*	*-2.5*	*-2.23*	*-1.54*	*-3.2*	*-2.71*	*-4.42*
***p*-value**	*0.25*	*0.18*	*0.35*	*0.52*	*0.0015*	*0.03*	*0.13*	*0.002*	*0.009*	*0.0004*

Table 2. t-tests for difference in average distances

	Constant	Distance
Coefficient	*0.2985714*	*0.5476531*
***p*-value**	*0.009*	*0.000*

Table 3. Regression of prices on average distances (the price of luck)

Table 3 shows the results of a regression with subject fixed effects that explains the willingness-to-pay in terms of distance. It is easy to see from tables 2 and 3 that willingness-to-pay significantly increases with distance. That is, once subjects are willing to pay for a luck premium they will be willing to pay more for more luck than for less.

[7] Switching from 0 to 1, from 1 to 2, from 2 to 3, from 3 to 4 and from 4 to 5.

3.2 Fixed Price treatment

We run two sessions of the Fixed Price treatment: FP-1, with 19 Group B subjects, and FP-2, with 28 Group B subjects. In FP-1 the minimum number of hits in Phase I was 1 and the maximum 5. In FP-2 the minimum and maximum number of hits in Phase I were 1 and 4 respectively. The fixed switching prices (*Y*) offered to Group B subjects correspond to the median switching prices in the BDM treatment for the 1-5 and the 1-4 distances. That is, *Y* = 2 EUR for FP-1 and *Y* = 1.5 EUR for FP-2.

With these prices, about 21% of the subjects decided to switch both in FP-1 and in FP-2.[8] These two percentages can be firstly compared to the 50% in the BDM, given that the median divides the distribution in two halves. We would then obtain a 42% of the initial effect in the FP treatments. There are two important caveats to this interpretation of the results.

First of all, note that in the BDM treatment we obtained quite a few values exactly at the median (1.5 EUR). The result could change substantially if the 21% switching rate in FP was to be compared to the BDM switching rate strictly above the median (just 43% rather than 50%). In that case we would obtain a 49% of the initial effect.

Second, and most important, if the BDM overestimates the willingness-to-pay (as the “payoff dominance” critique implies) the median would be biased in the same direction. Therefore the effect in FP would be stronger than appears. It is impossible, or at least very hard, to correct for such bias so we chose to use original median for comparison.

4. Discussion

The BDM treatment suggest that the vast majority of students in an Advanced Finance cohort both fail to understand iid variables and behave in a manner compatible with beliefs on prescriptive luck. This result is weaker, but still strong and prominent when fixed prices rather than the BDM elicitation procedure is used. Several considerations need to be taken in order to better qualify these results.

First of all, it has been reported that the BDM procedure we used may not be behaviourally strategy-proof and thus under or overestimate the willingness-to-pay. For instance, Cason and Plott (2014) argue that subjects fail to understand the game form; Horowitz (2006) claims that willingness-to-pay depends on the distribution of potential prices; Noussair et al (2003) conjecture that differences in the shape of the payoff function drive the results in an experiment in which the Vickrey auction outperforms the BDM in terms of finding the true willingness-to-pay. Note that all the biases mentioned before are based on subjects having a positive valuation of the

[8] Exactly 21.05% and 21.43 for FP-1 and FP-2 respectively.

“object”, a positive willingness-to-pay. None of them could induce subjects to be willing to pay for a worthless object. In our design, refusing to pay a premium on the basis of past lucky outcomes is a first-order dominant choice, given independence. That is, for a rational individual the willingness-to-pay to switch must be equal to exactly zero.

The only relevant critique to our use of the BDM is “Payoff dominance” problem reported in Harrison (1992) could explain both under-reporting and over-reporting of the willingness-to-pay. The argument is about the negligible cost of a seemingly sizable deviation from the true willingness-to-pay. The example calculations in Harrison (1992) result in costs as low as $0.001. In our case the cost of the average deviation when asking subjects about their willingness-to-pay to switch from 0 to 5 hits is 3.6 EUR resulting on an expected cost of 1.3 EUR, several orders of magnitude higher than the calculation in Harrison (1992).

Both treatments, BDM and FP, detect behaviour compatible with a Belief in Luck. We don’t think either of them provides a perfect point estimate. For instance, in FP an irrational individual has only one opportunity of choosing a dominated option. The BDM provides sixteen opportunities to each subject to choose a dominated option. It should not be surprising to see how most subjects behave in such a way, at least once.

Second, the experiments were conducted in the classroom. The lecturer of the fourth year, Advanced Finance course was present. Note that the principles on which our experiment are based are essential for finance. The presence of the lecturer was meant to reinforce students’ rational behaviour, that is, if there was an experimenter demand effect it should have worked in the direction of inducing rational behaviour..

Third, our explanatory conjecture, superstitious beliefs in concepts such as prescriptive luck or ESP phenomena have been previously investigated by social psychologists. For instance, the experimental behaviour observed by Roney and Trick (2009) is compatible with Sympathetic Magic (or *Sympathie-Zauber*), a concept coined by the XIX century ethnographer Richard Andree, see Andree (1878). Sympathetic Magic follows the Law of Similarity: any effect can be reproduced by imitation. That is, if someone got five hits in a row there is a high chance he will do it again. Rodney and Trick (2009) find Hot-hand results when an observer is asked to focus on the individual who tosses a coin. Observers revert to the gambler’s fallacy in a treatment when they are asked to focus on the coin rather than on the individual who tosses the coin.

We may well have found an ancestral way to deal with risk, deeply hard wired in our brains. This idea is not new. It starts, at least, with the concept of *Prägnanz*, central to the *Gestalt* psychology (see for instance Humphrey, 1924). According to the *Prägnanz* principles, the brain tends to order experience in a manner that is regular, orderly, symmetric, and simple. Following this view, a probabilistic understanding of reality, given from instance by EUT, could well be rational, but also unnatural. Experiments in psychology and neuroscience seem to support this approach: in order to produce judgements the brain uses heuristics that are in general quite useful, but could also lead to severe and systematic errors.[9] We believe we have found another instance of one of such heuristics, the well-known ‘take the best and forget the rest’, which indeed leads, in our case, to systematic errors.

Our result must not be taken at face value. If so, it would severely undermine the received opinion of the majority of economists about the decision making of agents and the models that are based on them. The ability of economic agents to understand independent and identically distributed statistical (iid) variables is a cornerstone of contemporary economic theory. Without that ability, anything from statistical inference to Bayesian updating just becomes off-limits. For instance, the most popular of the mainstream Macroeconomics and Finance models, Dynamic Stochastic General Equilibrium and Modern Portfolio Theory, rely on representative agents capable of inferring the right probabilities to maximise profits.

We believe that psychological theories should be used more, and more often, by economists and other social scientists. Models based on fully rational agents could be perfectly justified and generate good predictions in some contexts, but not, and this should be taken as a punchline, in *all* of them. The path for a fruitful future research on contextualised modelling is open and clear.

[9] This is commonly accepted knowledge in psychology. See, first of all, Tversky and Kahneman (1974). The same ideas are also present with a different guise in Glimcher and Fehr (2014).

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Appendix

GENERAL INSTRUCTIONS

Welcome to this experiment,

IT IS VERY IMPORTANT TO REMAIN SILENT DURING THE WHOLE EXPERIMENT!!!

If you have any doubts about the instructions please raise your hand and wait until one of the experimentalists comes to your place to solve it.

You will receive 4 € as a show-up fee.

This experiment has three phases that called PHASE ONE (only Group A plays), PHASE TWO (only Group B plays), and PHASE THREE (Group B and part of Group A plays).

There are three types of players:

Players from group A

Players from group B

Player X: (THE INNOCENT HAND)

PHASE ONE

In this phase players in group B do not play, they only observe, so only the group A players act. Group A players must bet heads or tails when player X throws a coin. The players that guess right will obtain 2 € and the ones that don't get 0 €. Player X earns 10 € for her participation.

The process will be as follows:

1- Every player A will make her bet in an individual way: if she bets that heads will come out, she writes down a C in the cell "Bet" and if she that tails will come out she writes a + in the cell "Bet" in the folder that has been given to her.
2- Player X will throw the coin
3- Every player A will check the result (heads or tails) and will fill the cell "result" by writing a✓ if she had the right answer and an X if she didn't. All these can be found in the documents that have been given to players A.

There will be five rounds of this process. The bets will be made before each one of the throws. We will check that before each throw all players in group A have made their bets. Once the five rounds have been completed the documents will be collected.

After that a group of 6 players A will be selected and we will invite them to go out of the room. The selection will be made according to the different possible results that might come out in the five rounds.

The selected players A will go out of the room and wait for instructions.

The rest of players A will remain seated in their places during the rest of the experiment until they are called to be paid what they earned in the experiment.

PHASE TWO

This is the phase where players from group B participate in an active way in the experiment.

Each player B has an initial endowment of 10 €.

We assign by default to every player B one of the players that have been selected to leave the room, specifically the one that had the lowest number of right answers in PHASE ONE.

In phase three we will repeat the five rounds of coin throws as in the first phase. Players from group B will not bet. Players B's earnings will be determined by the player A that has been assigned to them (minimum number of right answers). This earnings will be of 2 € per right answer. But players B have the opportunity to change from the assigned player A to the one that had the maximum number of right answers in phase one.

To switch from the assigned player to the one with the highest number of right answers B players must pay a price.

The way to determine if a player B will switch from the assigned player A to the one of maximum number of right answers or will remain with the assigned player A works as follows:

1- First, every player B will determine the price that she is willing to pay to switch from the A player with the minimum number of right answers to another A player with higher number of right answers. This will be done by filling in the table that has been given to them in the documentation.

PLAYER Nº				**GRUP B**		
	Player to switch to					
Assigned player	0 right answers	1 right answers	2 right answers	3 right answers	4 righ tanswers	5 right answers
0 right answers						
1 right answers						
2 right answers						
3 right answers						
4 right answers						
5 right answers						

The prices for changing can be expressed in fractions of 0.5 €.The maximum price that can be paid is the initial endowment of 10 €.

2- Second, the organizers will reveal the results of the selected players A so players B will know the number of right answers that the player they have been assigned to had, and will also know the score of the maximum number of right answers. This will allow players B to know which cell in the table they are playing with.
3- Third, we will determine the random price of change by a lottery. If the price of change that player B has set is lower than the lottery price then player B doesn't switch. If the price of change that player B has set is equal or higher than the lottery price then player B switches to the player with the maximum number of right answers by paying that lottery determined random price.
Each player B must write down the player that finally is assigned to her in the cell on the first page of the documentation she has been given.

4- If player B does not change, she bets 2 € per round.
If player B does change, her bet will be:

$$bet = \frac{(10€ - random\ price\ of\ change)}{5}$$

The earnings will be double the bet.

*As an example: If the random price of change is 2.5 €. Player B bets (10-2.5)/5=1.5 per round, so if she get the right answer then the earnings will be double = 1.5*2=3. Wrong answers have a cost of 0 €.*

After that we will let into the room the 6 players A and identify the player with the minimum number of right answers and the one with the maximum number of right answers and they will proceed to play the five rounds of coin throws.

While players A come into the room we will collect the documentation from B players.

PHASE THREE

In this phase we will proceed as follows:

1- Player A will make her bet out loud: Heads or Tails
2- Player X throws the coin
3- Te result will be written on the board.

There will be five rounds for each of the two players (minimum and maximum number of right answers). Bets will be made before each throw.

Players A do not earn money in this phase.

Players B's earnings depend on the amount of right answers that the A player they are assigned gets.

Once the experiment has finished it is important that all players remain seated until they are called by their number to be paid what they have earned in the experiment.